In the patent application, claims 1-21 are pending. In the office action, all pending claims are rejected.

At section 2, claims 1, 5-10, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Jankowski* (U.S. Patent No. 6,638,654), in view of *Koripella et al.* (U.S. Patent Number 6,465,119 B1, hereafter referred to as *Koripella*).

In rejecting these claims, the Examiner states that *Jankowski* discloses a fuel cell comprising a planar substrate 44 having a plurality of apertures 43. The Examiner admits that *Jankowski* fails to disclose securing a plurality of membrane electrode assembly (MEA) segments on the apertures 43 and to disclose the fuel being a mixture of methanol and water. The Examiner points to *Koripella* for disclosing a plurality of MEAs on a substrate surface wherein each MEA covers an individual orifice in the substrate surface (Figures 1 and 2). The Examiner states that it would have been obvious to one of ordinary skill in the art to combine the multiple-MEA feature in *Koripella* to the fuel cell as disclosed in *Jankowski*.

Applicant respectfully disagrees.

The present invention is concerned with a fuel cell for use in a portable device wherein the MEA can be repaired without discarding the entire proton-exchange membrane in order to reduce the associated cost (p.1, lines 27-32, of the specification). The fuel cell, according to the claimed invention, has a substrate with a plurality of openings to support a plurality of MEA segments, so that if one MEA segment is defective, it can be separately replaced (p.6, lines 5-10; p.9, lines 19-22). Furthermore, the MEA segments are electrically connected in parallel (Figure 5), in series (Figures 6a and 6b) or as a combination of series and parallel connections (p.8, lines 7-10).

Koripella discloses a fuel cell array having a base portion to support two individual fuel cells. The base portion has an interconnecting manifold to supply a liquid fuel component to the individual fuel cells.

Jankowski discloses a micro-electro-mechanical system (MEMS) based thin-film fuel cell for electrical power applications. *Jankowski* discloses a miniature power source composed of a

stack of fuel cells fabricated by combining MEMS and thin-film deposition technologies to produce fuel cells with micro-flow channels (col.1, lines 11-17; col.3, lines 58-64).

In particular, the MEMS-based fuel cell is materials-flexible (col.4, lines 12-15). The fuel cell stack is fabricated using thin film electrodes, catalysts and ion-conducting layers deposited by physical vapor deposition techniques. The stack is patterned with electrical connections using standard micro-fabrication techniques and subsequently formed into free-standing or supported membranes by micro-machining away the silicon substrate. Manifold structures are fabricated through silicon micro-machining techniques (col.4, lines 16-23). In a bulk solid oxide fuel cell, the thickness of the electrolyte layer is on the order of 1 micron (col.1, line 64 to col.2, line 2). In a proton-exchange fuel cell, the components of the membrane electrode assembly 41 are formed into a free standing membrane by selective etching of openings or windows 43 in a substrate 44 (col.6, lines 14). Integrated circuit type micro-fabrication processes are used to pattern the electrode contacts within the fuel cell stack structure (col.6, lines 11-14).

From the description, *Jankowski* is concerned with a miniature fuel cell, which is thin and flexible. It is known that, in a proton-exchange fuel cell, the electrical current is proportional to the area of the proton-exchange membrane exposed to the reactants. Unless it is absolutely necessary, it would be wasteful to use micro-flow channels to supply a reactant to the membrane electrode assembly, as asserted by the Examiner. Therefore, it can be reasonably assumed that *Jankowski* uses the substrate with micro-flow channels in such an MEMS-based thin-film fuel cell, because the membrane electrode assembly is too fragile to be fabricated on a substrate with a single opening.

Because of the size of the fuel cell and the membrane exchange assembly itself, it would not be practical or cost-effective to repair a defective MEMS-based fuel cell by replacing or repairing the membrane electrode assembly. It would be more difficult to replace the membrane exchange assembly if the fuel cells are integrated into a stack. Since it is already impractical to replace the entire membrane electrode assembly 41 in an MEMS-based thin-film fuel cell 40, it is difficult to imagine why anyone who is skilled in the art would put a plurality of membrane electrode assembly segments on the substrate 44, with each segment being sized to cover the opening or window 43 of one micro-flow channel, so that each membrane electrode assembly

segment along with the corresponding micro-flow channel will function like a fuel cell as disclosed in *Koripella.*

The Examiner states that it is wasteful to place a single, continuous film in a fuel cell to cover a plurality of fuel channels because of the un-exposed membrane areas. It would be obvious to one skilled in the art to modify the fuel cell as disclosed in *Jankowski* by providing a plurality of membrane electrode segments wherein each segment is provided over a corresponding opening as taught by *Koripella.* Applicant respectfully disagrees for two reasons:

First, the electrical current or the efficiency of the fuel cell does not increase simply by replacing a single, continuous film with a plurality of membrane electrode segments, because the total proton-exchange area does not increase.

Second, if the object is to reduce waste, it is more logical to reduce the number of openings 43 and enlarge the openings 43 at the same time so as to increase the exposed areas to the reactants. Ideally, the number of openings is reduced to one.

The object of the claimed invention is not to reduce the wasteful area of the membrane exchange assembly. Rather, the object is to make repairing a defective cell easier and cheaper.

According to MPEP 2143.01, the mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability for the combination. Because of the dimension of the MEMS-based fuel cell itself; the size of the micro-flow channels and the involved technologies such as micro-fabrication and silicon micro-machining, it would be difficult to imagine one skilled in the art would combine the fuel-cell array feature of *Koripella* with the MEMS-based thin-film fuel cells of *Jankowski.*

For the above reasons, *Jankowski*, in view of *Koripella*, fails to render claims 1, 5-10, 12 and 13 obvious.

At section 4, claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Jankowski*, in view of *Koripella*, and further in view of *Morse* (U.S. Patent No. 6,960,403) or *Arroyo* (U.S. Patent Application Publication No. 2005/0019635). The Examiner cites *Morse* for disclosing sealing a micro-scale fuel cell between adjacent substrates wherein the sealing is provided to prevent reactant crossover between the anode and cathode. The Examiner cites *Arroyo* for disclosing an adhesive bonding.

It is respectfully submitted that claims 3 and 4 are dependent from claim 1 and recite features not recited in claim 1. For reasons regarding claim 1 above, *Jankowski*, in view of *Koripella*, and further in view of *Morse* or *Arroyo*, fails to render claims 3 and 4 obvious.

At section 5, claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Jankowski*, in view of *Koripella*, and further in view of *Pratt* (U.S. Patent No. 6,127,058). The Examiner cites *Pratt* for disclosing a diffusing layers over the electrodes.

It is respectfully submitted that claim 11 is dependent from claim 5 and recites features not recited in claim 5. For reasons regarding claim 5 above, *Jankowski*, in view of *Koripella*, and further in view of *Pratt*, fails to render claim 11 obvious.

At section 6, claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Jankowski*, in view of *Koripella*, and further in view of *Pratt* (U.S. Patent No. 6,127,058). The Examiner cites *Pratt* for disclosing a parallel electrical connection.

It is respectfully submitted that claims 14-16 are dependent from claim 12 and recite features not recited in claim 12. For reasons regarding claim 12 above, *Jankowski*, in view of *Koripella*, and further in view of *Pratt*, fails to render claims 14-16 obvious.

At section 7, claims 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Jankowski*, in view of *Koripella*, and further in view of *Mardilovich et al.* (U.S. Patent Number 7,033,691 B2, hereafter referred to as *Mardilovich*). The Examiner cites *Mardilovich* for disclosing a portable computer or PDA.

It is respectfully submitted that the independent claim 17 has the limitations of claim 5. For reasons regarding claim 5 above, *Jankowski*, in view of *Koripella*, and further in view of *Mardilovich*, fails to render claim 17 obvious. As for claims 18-21, they are dependent from claim 17 and recite features not recited in claim 17. For reasons regarding claim 17 above, *Jankowski*, in view of *Koripella*, and further in view of *Mardilovich*, fails to render claims 18-21 obvious.